N.A.C.A. BULLETIN

In Two Sections

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EDITORIAL DEPARTMENT NOTE

No person skilled in his calling, whether he be a professional man, an artist, or a craftsman, is ever fully satisfied either with the tools he uses or with his employment of them. Among the tools of cost control are historical comparisons, standard costs, variable and fixed budgets, and internal reports. Our first article provides a discerning commentary on the applicability of these devices to the objective sought.

The presentation is written by CLARENCE B. NICKERSON, Professor of Accounting at Harvard Graduate School of Business Administration, Boston, Mass., with which he has been connected since 1930. Professor Nickerson spent the year 1941 in business and has engaged in consulting and research work in industrial accounting in addition to teaching. He is a Past President of Boston Chapter.

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It is perhaps a frequent supposition that high labor costs may be controlled through procedures tending to increased efficiency but that high prices preclude doing much about material costs. Our second article bypasses this assumption and analyses the field of material cost control into eight areas in which control is viewed as necessary and practicable.

I. WAYNE KELLER, the author, has been Assistant Controller of Armstrong Cork Co. since 1943. Mr. Keller joined his company in 1930 and was named Chief Accountant in 1938. An active member of N. A. C. A. for many years, Mr. Keller served as National Director in charge of Member Attendance in 1946-47 and is now chairman of the Association's Committee on Research.

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In many instances, dollars have been supplanted by hours as the unit in which to express labor cost control data intended for the use of operating personnel. Objectives are to make such data more promptly available, stable as between periods, and readily understandable. A procedure to effect control of assembly labor costs primarily by daily reports of hours expended, accumulated against hours estimated, is provided by our third article in this issue.

The presentation is contributed by JOHN G. GOETTEE, until recently Administrative Assistant to the Factory Manager of Bendix Radio Div., Baltimore, Md., where he also headed the production control and cost accounting operations. Mr. Goettee is a C.P.A. in Maryland and is a member of the staff of a public accountant in Baltimore. He is also an instructor in Industrial Organization at Johns Hopkins and in Accounting at the University of Baltimore.

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Very few accountants would prefer to limit the amount of detail in which stores records are carried if the cost of such detail can be kept reasonable. The final article in this issue offers a specific procedure for centralized stores-keeping, intended to afford a ready control of quantities.

The author is FORREST W. BERRY, Assistant Manager, Portage Country Club, Akron, Ohio. Mr. Berry entered industrial accounting in 1913 with the Sherwin-Williams Co., Cleveland, and served also with Firestone Tire & Rubber Co. and, in retail store management, with the B. F. Goodrich Co., both of Akron.

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COST CONTROL — A REVIEW OF TECHNIQUES

by CLARENCE B. NICKERSON,

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COST control is a subject of perennial concern to accountants, though in its practical application achievement is usually hard won, and indifference is frequently encountered. In such a situation it is sometimes helpful to sit back and take stock of what we are doing, to review our concepts and fundamentals, and to rekindle our enthusiasm for this aspect of our work. Cost control should be a cooperative venture involving all who have spending authority in a company and not a matter to be placed in the hands of a single individual, department, or committee. On the other hand accountants are in a position, and I believe it should be our responsibility, to provide the spark or impetus for improvement, and the maintenance of sustained interest in this work.

Historical Comparisons Remain Useful

Of late years it has become popular to belittle the older type of cost report involving a simple comparison of costs for the current period against the costs of a prior period. Examples are comparison of the costs this month against the same costs for last month and for the same month a year ago or comparison of costs for the year to date against the costs last year to the corresponding date. It is argued that records of past performance for specific periods do not constitute suitable standards against which to compare present performance. This is indicated to be so because, first of all, only by chance will two periods be operated at exactly the same volume. In the second place each period is likely to contain some nonrecurring costs, and changes in prices, products, manufacturing methods, etc., also vitiate comparisons.

Though one may agree with these arguments, as does the writer, it does not follow that reports featuring such comparisons are necessarily misleading or of no value. It all depends upon the matter in which they are interpreted and the uses that are made of the interpretation. They do not provide close measurement, but they can be useful in flagging situations that appear to merit investigation or close watching.

A particular use of intraperiod comparisons is to spot situations calling for cost reduction. I have in mind a company that was

operating at high volume and was within its predetermined allowance for spoilage as set up in its variable budget. In studying the comparative statement of present and past performance the general manager was struck by the size of the current spoilage cost. Although he recognized that the amount could be justified by the variable budget allowance, it was so large that he felt that it merited special attention for possible cost reduction. This was done and the spoilage was reduced substantially. The variable budget standards were changed to conform.

Relationship of "Scientific" Standards to Past Performance

It seems to me, despite many articles on variable budgeting which stress the importance of establishing scientific standards and the dangers of relying on past experience in setting them, that past experience rightly plays an important part in the establishment of standards. It is hard, for example, to conceive of a man with no past experience of his own and no access to the experience of other companies or people, setting up a variable budget for a company on the day it opens for business. What is meant, of course, is that we should not follow our past experience blindly but should take account of random variations, of changes of many kinds that have affected costs over the years of experience, and of conditions expected in the future.

Although the application of certain statistical techniques has made a real contribution to this field and although I have no wish to belittle the aim of establishing scientific standards, it seems to me that the standards that have been developed in the past and those that are likely to be developed for some time in the future have involved primarily the application of a good deal of common sense and lots of hard work. Associated with this process, the variable budget has rapidly and deservedly earned a place in industry as a very useful tool of control. However, I do not think that we further the sound development of even this forward-looking device by stressing it to the exclusion of older tools of control, such as comparative reports, fixed budgets, and standard product costs, all of which have their place in the control picture.

Standard Product Costs and Variable Budget Standards

In industrial accounting literature the emphasis in recent years on the variable budget as a tool of control has overshadowed the use of product standard costs for control purposes. However, in those companies in which material and labor constitute a large

part of the total cost and in companies producing a wide variety of products, standard costs are likely to provide the major tool of control while the variable budget provides control data in the minor though important area of controlling burden.

Perhaps it would be well to note at this point that considerable differences exist among companies in distinguishing between standards represented by standard costs and those implied by variable budgets. There are cases, for example, where variable standards are in use but the companies claim to be using a standard cost system and make no mention of variable budgeting. There are other cases where it would appear from reading top management reports that the variable budget provided the entire control data, yet investigation would reveal considerable detailed control data prepared on a standard cost bases. One company sought to clarify its own situation by calling standards for product costing "standard costs" and standards for variable budgeting "cost standards." It is evident that when people are discussing matters in this area it would be well for them to define their terms so that they can be sure that they are talking on the same subject.

For our purposes here, I should like to think of standard costs in terms of unit costs such as those that a cost accountant would enter on a standard cost sheet for an article made by his company. For variable budget purposes I should like to think of costs by areas of spending responsibility, such as a department, related to some suitable measuring stick of activity for that area, such as direct labor hours. These terms will be further defined below with respect to standard costs and in a later section with respect to the variable budget.

Standard Product Costs for Control of Prime Costs

If *close* control over material costs is to be maintained the standard cost of material required for each unit of product must be established in detail and the cost of material actually used must be accounted for in similar detail and reported in time to take effective action. In many companies it is helpful if the price variance on material is separated at the time of purchase and inventory is carried at standard cost. In this way, any variances accounted for later will be yield or use variances unaffected by price. Detailed records of the actual and standard cost of materials processed provide additional check on the quality of material purchased, by source of supply, fixes responsibility on individuals or

departments for the quality of their performance, and identifies yield or spoilage by specific lots or types of product. Prompt reporting of such costs can lead to prompt action when costs are out of line at specific points.

Such record keeping is of course expensive and is not worth while if the possible losses from lack of control are minor or if the information is ignored. Of course, it should be remembered that it is difficult to determine or even prove the existence of savings from losses that have been avoided through the maintenance of such records. It is my belief that close control over material costs can be maintained only if information is provided through detailed unit cost records. Short cuts can be taken by restricting detailed records keeping to critical points at which losses might be significant. The more general type of report, such as reports showing actual cost against a budgeted figure, are helpful in the interpretation of financial results but are not of much assistance to cost control. About all they can lead to is desk thumping and promises to do better.

Standard costs aid in the control of labor costs in much the same way as with materials. Some companies have found it simpler and more effective to provide control data in the form of actual and standard direct labor hours by operations for jobs or lots of product rather than in dollars. By omitting the work involved in computing dollar figures, the detail can be gathered more promptly and nonstandard performance reported quickly for action. Of equal importance, direct labor hours have been found by these companies to be a better common denominator for activity than direct labor dollars, especially to meet the thought habits of operating men. Further, if the hours are under control, the cost will take care of itself.

When piece rates or incentive wage plans are in use, the direct labor cost is for the most part automatically under control and the actual labor cost and standard labor cost of good products will be the same because only good product is paid for and only at standard rates. This does not, however, take into account the fact that the worker who spoils a piece scraps all of the labor that has been paid for on it up to that point. The piece work basis controls the labor applied to product that runs through all operations as good pieces but does not control the labor applied to pieces spoiled. In this sense it does not control the efficiency of labor.

Variable Budget Standards for Burden Control

The opinion is held in some companies that the standard burden costs as applied to obtain product costs and as used for inventory valuation, determination of cost of goods sold, and pricing, should also be the standard costs for control purposes. It is recognized that this makes a tight standard when volume is low and a lenient standard when volume is high, but it is felt that this is desirable. It applies pressure on operating personnel when volume is low and cost reduction essential. When volume is high and extra cost less harmful, pressure is automatically relaxed. It is believed that intelligent interpretation of variances can make proper allowance for the handicap under which the operating man is working when volume is low and not permit excessive latitude when it is high.

However, in other companies, it is felt that such an approach to the control problem it is not fair to operating men. It does not provide them with the proper goals for attainment or take into account the real relationships of these costs to changes in volume. It does not provide sufficient information and guidance in detail for the many items involved in burden costs. In such companies, the variable budget is considered to be much more useful than standard costs as a tool of cost control as far as burden costs are concerned. With the exceptions to be noted later on, I am in agreement with this point of view. In other words, standard costs are the most useful aids in the control of material and labor, but the variable budget is more useful in the control of burden.

The development of the variable budget technique has been a particularly useful contribution to the control of variable burden costs. It has stimulated real study of such costs in relation to changes in volume of activity. It has recognized the importance of control at the point of expenditure by providing variable standards as goals for accomplishments as well as check up reports of actual costs against standard by areas of responsibility, such as departments. It has likewise concentrated attention on controllable costs.

Where Does the Fixed Budget Fit In?

Many discussions have taken place in recent years on fixed budgets versus variable budgets for cost control purposes. It has seemed to me that proponents of fixed budgets are generally persons connected with companies which do not experience wide fluctuations in volume of operations or in which it is or has been

relatively easy to forecast volume. Where these conditions are not present and where a significant amount of burden varies with changes in volume, the variable budget would seem to be more appropriate than the fixed budget for cost control purposes.

Sometimes there is a question as to whether a company is in fact using a fixed or a variable budget. I have in mind the case of a friend who runs a boys' camp. During the depression it became necessary for him to plan his expenses carefully and he therefore drew up a budget on the assumption of an enrollment of 125 boys, which he believed was a reasonable expectation. As a matter of interest he also prepared budgets for 100 boys and 150 boys. Did he have three fixed budgets or a variable budget? How many fixed budgets does it take to make a variable budget?

All this does not mean, however, that the fixed budget should be eliminated. It still is useful for other planning purposes. It is reassuring for cost control purposes under a variable budget to know that no matter what volume of business is experienced you will have a budget for it, but this is small comfort to the treasurer who has to make arrangements for bank loans during the coming year or the purchasing agent who has to purchase material in advance of known production requirements. Nor is it of much help in setting goals for attainment during the coming period and fixing responsibility on individuals in connection with such goals.

It should be evident to accountants that the variable budget does not supplant the fixed budget except for certain aspects of cost control. The fixed budget is still desirable as an expression of financial and operating plans. It is still desirable to check actual results against such plans. Finally, there are many costs, such as administration costs and certain selling costs like advertising, which do not vary with any short run measure of production or sales activity. For these the fixed budget is a proper guide.

Pitfalls in Establishing Control Through Variable Budgets

There is further thinking to be done in many directions with respect to variable budgeting. One of these is the manner in which the technique should be studied and put into practice by a given company. Anyone who has gone over the installation of variable budgets in several companies has probably noted instances in which he felt that the budgets had been put in too hastily. Among the causes that can be found for this haste are pressure from top management to put the budget into effect immediately and over-

eagerness on the part of the budget director or accountant charged with the installation. These pressures from above or from within ourselves for quick results are too serious to be easily sidestepped. On the other hand, the variable budget is not a short-run emergency device for cost reduction but is rather a long-range program of cost control. Such a program, to be most effective, requires the cooperation of all who have spending authority and involves a long period of education.

If given complete freedom of action, the person in charge of the installation might best start with one or a very few departments headed by men who are fairly certain to take an intelligent and sympathetic interest in the program. Once the budget has been launched in this way, and the inevitable defects have been pretty well ironed out, it is much easier to arouse the interest and cooperation of other departments and to bring them into the fold. Another approach which can be quite successful is to limit the budget first to one or two types of expense but to install the program as rapidly as possible in all departments. This can be a practical compromise in a situation where the pressures indicated above are present.

In passing, it is my belief that many companies have overdone the detailed coverage of items under variable budgeting and have thereby reduced the effectiveness of the program. I believe that the variable budget should treat in detail only the most important items of variable burden cost and that the remainder should be lumped together as "all other" or should be omitted from the variable budget altogether and brought up to the surface only once a month in the comparative statement of present and past performance. Unless something of this sort is done, the impression can develop all too easily among operating people that the variable budget is the plaything of the statistician and accountant, an expensive mechanism for control of relatively minor costs.

The Foremen and Noncontrollable Costs

Many companies find it desirable to omit from budgets and reports for foremen and department heads all fixed costs and other noncontrollable costs. While it is true that the foreman or department head has no control over the amounts that are to be charged off or spent for these items in any given period, he does have considerable control over the utilization of time and the output of his department which represents the only means by which such costs

can be recovered on a going concern basis. To put it another way, the foreman or department head is the steward of a considerable amount of expensive equipment and space. In addition, the existence of these facilities and the operations performed within and through them make necessary a variety of general overhead expenses. One of the foreman's responsibilities is to make efficient use of these facilities. It seems to me desirable to make him at least aware of the cost to the company when he does not use these facilities efficiently.

I believe that the foreman should be made aware of what the facilities put at his disposal cost the company per direct labor hour or machine hour at normal volume. Granted that he should not be held responsible for unabsorbed costs due to lack of volume nor given credit for overabsorbed costs because of volume above normal, he should be held accountable for unabsorbed costs resulting from the inefficient use of time in his department and given credit for overabsorbed costs resulting from efficiency above normal. Efficiency variances like this, by causes of variance, can be and are computed by many companies under a standard cost system. They serve well as a supplement to variable budget reports.

Labor Hours or Machine Hours as Activity Bases

In establishing cost-volume relationships under variable budgeting, the selection of a suitable measuring stick for volume of activity is sometimes a problem. If a variety of products are manufactured, there is no common product unit by means of which to express the total activity for a department for a given time period on a product unit basis. Direct labor payroll is easily available as a measure of activity but represents an unstable base because of changes in rates of pay. This leaves direct labor hours or machine hours, whichever is more important in the given situation, as the most suitable measure of activity.

In some situations it may be that allowed hours (i.e., good units produced times standard per unit) represent a suitable measure of activity. This is comparable to units of product as a measure in companies manufacturing only a single product, or a few similar products that can be expressed in terms of an average product for budget purposes. However, allowed time or product units are not suitable measuring sticks for variable budgeting if there is any significant variation in the efficiency of operation and if the costs

to be controlled are more closely related to hours worked than to units produced. A simple example will illustrate the point.

Suppose that a department has operated for 10,000 actual direct labor hours during a given month and that its allowed hours are 9,500, i.e., it has produced 9,500 hours worth of good products. Should the expense allowances under the variable budget be based on 10,000 hours or 9,500? If the variable burden costs involved are more closely related to hours worked, then clearly the allowances under the variable budget should be based on 10,000 hours and the difference between these allowances and the actual costs incurred represents spending variances for which the department head should be held accountable. In addition, an efficiency variance for the 500 hours lost should be computed, broken down by causes, and the department head should be held responsible for those causes and hours lost over which he has control. To give the department head expense allowances for only 9,500 hours under the variable budget would be unfair to him in measuring his control over his spending activity and would cloud the whole picture by mixing spending and efficiency variances.

Presenting Variable Budget Allowance Data to Department Heads

Though the form of reports showing actual costs compared to allowed costs for the volume operated is quite similar among companies using variable budgeting, the form in which the budget data or standards are maintained shows more marked differences. For example, some companies prepare rather complete budgets in columnar form showing allowances for the whole range of probable activity, at (say) 5 per cent intervals. Some companies prepare their standards in the shape of formulas, some in the form of charts, and others prepare a normal budget with formulas to correct for changes in volume.

If the budget standards are to be furnished to department heads to be used by them as guides for their spending activity, the form in which they are presented is of importance. For such purposes I believe that the columnar form of presentation, showing the budget allowances in detail at various levels of activity, such as 5 per cent intervals, is most desirable. For some types of cost, it is of greater assistance to the department head if standards are shown in terms of people or units in place of (or as well as) dollars. For items such as supplies, it may be possible to provide him with a price list of major items so that he will know the cost of the items he is

requisitioning. It is a little unreasonable to hold a department head accountable for a dollar standard if he is spending in the dark.

Many companies find it desirable to prepare reports of actual outlay against standard on a weekly basis at the operating level in order that action may be stimulated, if necessary, before matters get too far out of hand. However, for some items, such as supplies, the week is too short a period to expect close adherence to budget allowances. It would be more significant to include, along with the weekly report, a report for the month and year to date.

The Human Aspects of Cost Control

Cost control involves action on the part of people responsible for expenditures. Forms, tables of figures, charts, and reports are aids to control but do not constitute control in themselves. Control is, therefore, a human problem and not a paper problem. Most accountants are well aware of this and are often despondent because of the lack of action on matters that they have reported. There is no satisfaction in supplying adequate and timely information if it is not used. Cost control should be a cooperative venture involving all who have spending authority in a company and not a matter to be placed in the hands of a single individual, department, or committee. The cost accountant, budget director, treasurer, and controller should be careful to make their positions clear.

This is a matter on which there is some difference of opinion. It is my belief that the cost accountant, budget director, treasurer, and controller should take the lead in the development of standards of cost performance, in the reporting of actual performance against standard, and in the interpretation of operating results, but that the responsibility for action on cost control lies with all who have spending authority (i.e., who direct operations involving costs) and that any discipline involved therein is their responsibility and the responsibility of those to whom they report in the organization. Of course, responsibility for cost control and for any discipline involved therein lies, first and last, with the president of the company. Except in their own departments, the cost accountant, budget director, treasurer, and controller are not in a position to take action on cost control and they should not be asked, expected, or assume to take the responsibility for exercising censure or discipline over other departments in this matter. They cannot effectively alternate between holding out the helping hand and turning the hand for the administration of discipline.

THE CRITICAL AREAS OF MATERIAL COST CONTROL

by I. WAYNE KELLER,
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A SURVEY of the published reports of a number of corporations indicates that in the average business the cost of direct materials is approximately forty per cent of the sales dollar. Certainly, in most businesses it is by far the largest component of of cost. Since this is true, the control of material costs should be given relative importance by the accountant. It is the purpose of this paper to survey the many facets of material cost control and suggest policies and procedures which can be adopted in this important phase of cost accounting. While the specific treatment will be of direct material costs, referred to hereafter as material costs, indirect material costs can, for the most part, be controlled by the same or similar procedures. The "paper work" of purchase requisitions and orders, receiving reports, stores records and requisitions, etc., will be mentioned only as it is incidental to cost control policies.

The placing of responsibilities for control follows the organization structure of the Armstrong Cork Company, and much of the subject matter was suggested by material cost control problems of this company. While cork is an important raw material of the company, its value is a small percentage of the total value of raw materials. Others of the hundreds of materials used in important quantities and values are linseed oil, pigments, natural and synthetic resins, natural and synthetic rubber, plastic molding powders, metal plate, rags, sand, soda ash, pulpwood, asphalt, clay, glue, and glycerine. Most of these are bulk materials with a relatively low unit value. However, there are some others which have a high unit value and therefore require great care in storage and extremely close control in usage.

Organization for Control

The first requisite for the control of material costs is organization, with responsibilities clearly established for all phases of the control problems. The accountant is the keystone in such an organization, for control will be no better than the accounting records and data which are established. The accountant's direct responsibility is one of recording, measuring, and reporting. His

functional responsibility should have no limits and he should be alert at all times to appraise and report to management the effectiveness with which material costs are being controlled in all areas.

The size and complexity of the control organization as well as the specific assignment of responsibilities will vary with the size and character of the business. In the larger businesses, control responsibility is frequently divided among the laboratory, engineering, purchasing, receiving and stores, production planning, standards of production, and accounting departments. In the smaller businesses all of these functions may be assigned to one person or may be performed in conjunction with other functions by several persons. The specific organization structure is not important, but the clear assignment and delineation of responsibilities is.

The control of material costs will be made easier and more effective if standards are established and if the standard material costs are recorded on the books, with accounting segregation and reporting of variances from standard. However, many control devices can be operated effectively if standards are not in use.

Areas of Control

There are eight areas of control of material costs and accounting is involved in each one of them. These areas are:

1. Specifications.
2. Purchasing.
3. Inventory.
4. Usage.
5. Scrap.
6. By-products and joint products.
7. Salvage.
8. Indirect costs.

Evaluation of Materials Specifications

The control of material costs begins with the establishment of specifications for materials. The technical experts establish the kinds of materials to be used and the yields to be expected. The laboratory is responsible for determining what kinds of raw materials shall be used and their chemical and physical characteristics. This department also establishes formulas and processing speeds which are affected by chemical reaction. Yields may be set by the laboratory if chemical characteristics are dominant or by the engineers if physical measurements are the determining factors. The engineers also establish the processing losses which may be expected because of spilling, adherence to containers, minimum possible processing damage, etc. In a larger corporation with many

plants or departments, the specifications established by the laboratory and engineering departments are usually cleared through a standards of production department which is responsible for placing the specifications in the hands of those who will need them and also for inspecting the products to see that they meet the specifications.

The accounting function with respect to specifications is one of evaluation. Before a specification is finally established, the accounting department determines its effect on the profit from the product. In many instances this may extend beyond the material cost and affect such things as production speeds, capacity, processing and handling equipment, and even customer acceptance. Therefore, such evaluation cannot be limited to simple application and addition of unit costs but calls for the exercise of sound business judgment and consideration of economic factors. Specifications do not become effective until approved by the accounting department. Where there is no standards of production department, the accounting department may also be responsible for routing, filing, and revising the written production specifications.

Purchase Variances and Materials Handling Procedures

With specifications established, it is the responsibility of the purchasing department to procure materials in accordance with the specifications at the best possible price. Since purchases are made only on purchase requisitions issued by the production planning department, it is necessary for purchasing and production planning to work very closely in determining what quantities shall be purchased. A requisition for the material requirements of the next month may be for a quantity which will be more costly than standard because of less than carload transportation costs, extra packaging or necessity of placing the order with a distributor rather than the manufacturer. Purchasing brings these matters to the attention of production planning and in many instances quantities are changed in order to secure a better price. Also, purchasing keeps production planning informed of current price trends and availability of material. Quantities purchased are then governed by these factors as well as by price.

The purchasing department sets standard material prices for each year. These reflect the best possible estimate of the average price which will be paid for each material over the year. Since these standards are used for interim inventory valuation and for

accounting they are approved by the accounting department. The approval procedure requires checking the price against recent purchases, analysis of the f. o. b. and delivered price to establish the inclusion of freight and the method of transportation, determination that the price is based on delivery in the customary form, bulk or package, and appraisal in the light of economic trends and specific industry forecasts.

Accounting control of material costs in the purchasing area is implemented through comparison of actual costs with standard as purchases are made, and through special material cost studies. Comparison with standard price is supplemented by determination that the description of the materials on the invoices is in accordance with the specifications and by a system of follow-up of the laboratory tests of inbound materials. Periodically studies are made, in conjunction with the engineering or production departments, of alternate methods of receiving and handling raw materials. Thus it may be determined that because of changes in plant layout, labor costs, or market conditions, savings can be effected by changing the purchase specifications.

Inventories: Control of Receipts and Storage

The physical receipt and storage of raw materials is the responsibility of the receiving and stores departments, and the quantities to be carried are the responsibility of the production planning department. The inventory records and values are the responsibility of the accounting department. It is in this area that the major emphasis of accounting control is frequently placed. All too often, the emphasis is placed here to the exclusion of other vital areas.

Physical loss can be detected and controlled if there are adequate records in which management has full confidence. Such physical loss is not limited to pilferage but can also result from deterioration, shrinkage, and damage. To keep each of these at an irreducible minimum requires rather detailed records but not more detailed than the records which are kept of cash. In many businesses the value of the inventories is greatly in excess of the cash of the company. Is there any reason, then, why inventories should not be controlled as carefully as is cash? Probably the only valid one is the general utility of cash as against the limited utility of inventory items. But this is offset by the fact that em-

ployees are more careless in handling inventories than they are in handling cash.

Pilferage can be eliminated through controlled receipt, storage, and issuance of the raw materials with complete transfer records through production and finished stock into shipments. The records must show quantities entering, on hand in, and leaving each storeroom or production operation. Then when shortages occur, it is possible to concentrate vigilance on a small area and thus detect the cause quickly. The very fact that a good system of control through records is in operation will provide a strong psychological deterrent to individuals who otherwise may be tempted to carry some of the products away.

The problem of shrinkage exists in many inventories and particularly with regard to raw materials. Such shrinkage may result from evaporation, seepage through the container, and adherence to the container. The accounting records should show the units received or produced in comparison with the units used or sold. By comparison of statistics of several periods, weighing "empty" containers, test gauging, etc., the amount of shrinkage to be expected can be established. An adjusting factor should be added to unit cost rates so that the units moving out of inventory will be costed at a rate higher than that at which they were charged in.

The mere passage of time causes loss in value through deterioration in most materials. If chemical and physical changes do not occur, the accumulation of dust and physical contacts through moving adjacent materials will usually cause damage. Wherever possible, all storage should be in lots or piles which are clearly identified on the inventory control records. Requisitions should be screened by the accounting department and marked to be taken from the oldest pile or lot. Then, if each is cleared completely before new material is added, there will have to be turnover. In addition to providing for good physical turnover, such records also provide automatic checks on the quantity in each location. As each pile or lot is exhausted, the records are marked accordingly and thus an automatic continuous check of physical inventories is effected.

An adequate system of securing turnover will not eliminate all obsolescence of materials. Changes in customer demand and in formulations cannot always be anticipated by the production planning department, either because the causes are outside of the enterprise or because other departments did not supply information

of trends. If the accounting records indicate that a material is not moving, an investigation should be made immediately to determine whether or not the condition is likely to be permanent. If it is, possible alternate uses or sales outlets should be explored and an estimate made of the value the material would have in each of these. When the best outlet is established, the loss which will result from using or selling through the alternate outlet should be charged to an account for loss due to obsolescence. If no alternate outlet can be found, the material should be scrapped and its full value charged to the obsolescence loss account. Such charges should have the prior approval of all departments having responsibilities for materials.

Inventories: Material Movement Costs

Costs of receiving, handling, and storing material are frequently of sufficient importance to justify the expenditure of a reasonable amount of control effort on them. It is possible to set labor standards for unloading, moving, and storing materials and for establishing expense rates to be applied to such labor. The material value charged into production should include such costs to the extent of one movement into the standard storage area and from that area to point of usage. Allowance should not be made for nonstandard movement of materials.

Thus, if materials are stored in areas not normally used, the difference between the actual cost of moving them into the areas and the standard allowance for movement into the standard areas should be reflected as a variance. The aggregate of such variances at the close of a period will measure the effectiveness of scheduling purchases, the adherence to standard containers or method of transportation and the efficiency of handling. While each of these may be computed individually through very detailed application of standards, it is usually unnecessary to do so, as reasons for variances can be established by scanning the receiving records and visiting points of storage of inventories.

When costs of storage and handling are determined, it may be found that the provision of storage space at each using operation is desirable. The possibility of more discrepancies in the inventory records because records cannot be maintained and physical movement controlled as carefully in each such operational storage area as in a central storeroom, may be more than counterbalanced by tangible savings from storing materials adjacent to point of use.

Responsibility for Inventory Valuation

Inventory valuation is the responsibility of the accounting department. Since valuation directly affects the cost of goods sold, no small part of the control of material costs rests on the method used and the adequacy of the records. Valuation will be determined first by the policy established by the company and second by the operations within the policy. With the increasing election of the "last-in first-out" method of inventory valuation, the accountant has a new area in which to guide management in establishing policy. Since few companies have their entire inventories valued on this elective method, there are items in each company which should be studied constantly to determine whether or not approval of the Commissioner of Internal Revenue should be requested for adopting the method for additional items.

After the basis is established, whether it is "first-in first-out" or "last-in first-out," the timing of increases or decreases in inventory can have a substantial effect on cost of goods sold. Here the accounting and production planning departments work hand in hand in operating within the established policies. If standard costs are used, another policy decision concerns whether to value the inventory at standard or at actual. The literature of N. A. C. A. includes many detailed discussions of these matters. It should be reviewed frequently and inventory valuation policies and procedures appraised periodically so that no opportunity for control will be lost. Conditions change constantly and inventory valuation policies can become obsolete just as the inventories themselves become obsolete.

Usage: Formulation and Yield Variances

At the point of usage, material costs can best be controlled through complete and detailed physical standards. The setting of these standards is the responsibility of the laboratory, engineering, and standards of production departments. The compilation of records, measurement against standards, and reporting of performance is the responsibility of the accounting department. In many processes material usage must be controlled in accordance with a standard formula. In these, the daily reports should show the comparison of actual units used with the standard units for the actual quantity of production. If changes in formulation are authorized, the report should show the revised formula units as well as actual and standard units. In the accounts it is frequently

expedient to establish a separate variance account which is charged with the actual raw material used and credited with production times the standard formula allowance. If this is done, variances due to formulation can be separated readily from variances due to yield.

If there are no problems of formulation, there will always be variances due to yield. Such variances may occur when the compounded materials are processed further, when other raw materials are put into process, or when processed materials are used in another operation. The standards should establish the amount of material to be used on standard equipment to produce a specified finished or semifinished product. If this is done, variances would occur if more or less than the standard quantity was used. The accounting records and reports should provide for the explanation of such variances as to cause and location of responsibility.

In applying standard costs to unit quantity standards, consideration should be given to unavoidable loss due to adherence to containers, spilling, and shrinkage. This can be done by adding to the inventory value of the material a percentage to cover these unavoidable losses of materials susceptible thereto. Thus, if the reported usage of plastic molding powder weighed into production is a thousand pounds and the unit raw material inventory value is twenty cents, the credit to inventory and charge to production may be a thousand pounds at 20.4 cents per pound to provide for a two per cent loss which experience has shown will be experienced on the average against the quantities taken into raw stock.

Keeping Scrap Losses Under Control

Frequently material damaged in process and nonstandard finished product is charged to plant expense and credited to inventory. While some control may be effected under this procedure, if expense budgets are used, the control will be less effective than it would be if standard scrap allowances are established. The engineers and standards of production department set the expected amounts and the standards of production department is responsible for all inspection. The accounting records show total production and the inspection reports show good production for each operation. In this way, actual scrap losses can be determined by production responsibility and dollar variances reported in the same manner. Process inventory would then be credited with ac-

tual scrap at standard value to its stage of completion which would be charged to a variance account. This account in turn would be credited with the standard allowance for scrap and process inventory charged.

Scrap or imperfect production may fall into three categories (1) that which is of no value and is destroyed, (2) that which can be reused, and (3) that which can be sold as imperfect goods. In the first category may be mentioned material which may have no value or such a low value that it is impractical to reflect it in the unit cost of the end product. This latter is treated as salvage and is discussed later. When scrap material is destroyed, the accounting stops with the comparison of actual scrap produced and standard scrap allowed. If there is expense of disposing of the scrap, such costs are usually included in the general expense of the plant.

If the scrap can be reused in formulation or reworked, the operation creating the scrap should receive credit for the value which it will have when reused. The scrap would then be carried on inventory at this value until reworked or reused. When imperfects are produced which can be sold as such, the production of perfects should be costed at a price greater than the cost to make so as to provide for a write-down of the imperfect values. Such adjustment is usually in relation to sales prices. Thus, if imperfects are sold at eighty-two per cent of the sales price of perfects and ten per cent of the production is imperfect, the perfects would be written up two per cent. (Write-down of 10 imperfects from cost to make of \$1.00 to \$.82 = \$1.80 ÷ 90 perfects = \$.02 write-up per perfect). This procedure will maintain the standard ratio of standard cost of goods sold to sales income and provide for fair inventory valuation.

By-products and Joint Products

Another important area of control is in the recognition and valuation of by-products and joint products. Production records should show the production of each grade of material from each production process. With standards established for expected quantities of each product or grade, comparisons can be made of actual production and reasons for variances established. If all the products or grades are sold, the valuation usually follows sales prices and presents no particular problems. However, if some of the joint or by-products are used as raw materials, detailed studies

must be made to establish proper values. If the material is used as a substitute for another raw material which would be purchased, the fair value of the by-product would be the value of the material it replaces or an arbitrary percentage of that value in order to give both the producing and using product an advantage. If some of the material is used as a substitute material and some is sold, the sales price at which it is sold should not be less than the price at which it is charged to the consuming product. Otherwise, the purchaser may be securing a competitive advantage.

Sometimes a new product is developed to utilize by-product materials for which no use had existed previously. The question then arises as to the value to be placed on the by-product material. If it is taken at no value because it is of a sort which had previously been destroyed and sales prices are set on this basis, it may be that a market will develop which will make it necessary to produce directly the material which previously was a by-product. Then the material which had no value becomes costly and the end-product which had been profitable suddenly shows a loss. Close control is needed here. It is probably in order to continue using the by-product at no value until the new consuming product is established. Then, either through cost reduction or sales price increases a residual after profit and other costs can be procured and assigned as a value to the by-product. It is the responsibility of the accounting department to follow all of these possibilities and establish joint and by-product values which will be fair to the consuming and producing end-products, maintain a sound competitive price structure, and encourage the utilization of all such materials to the fullest extent.

Salvage of Obsolete Equipment, Scrap, and Trim

A salvage section operates under the general supervision of the purchasing department. It is the responsibility of this section to review all requests for obsolescence of materials and equipment and determine whether or not any market can be found. This section is also informed of all scrap and trim losses, for, in some production, such as stampings from metal plate, there are frames which can be sold as scrap metal. In others there is scrap, such as ends of rolls and frayed edges of burlap which can be sold to nurseries for wrapping materials. Thus, while realizable values of these are too low to reflect in the unit cost of the end-products, they do have some salvage value. Through a constant search for

buyers, the salvage section is able to find outlets and realize substantial income from and save costs of hauling to the dump of items which otherwise would be destroyed. The accounting department has the responsibility of determining the net income from salvage and of crediting it to the proper operations or products.

Tracing Indirect Costs to Their Source

Inadequate control of material will not only increase the cost of the material component of the finished product but will also result in avoidable indirect costs. If the proper quantities of material are not available, shut downs or at least expensive machine or production line changes will be experienced. Inadequate testing of incoming raw materials or poor records of tests may permit substandard materials to be used, causing excessive scrap or completely ruining a lot or batch. Improper inspection of finished products and incomplete records of perfect and imperfect production may result in complaints from customers. Inaccurate finished stock records may result in unfilled delivery promises and loss of good will. All of these need only be mentioned to bring to mind the possible adverse effects on profits.

Then there is the indirect cost of financing the inventory. With the constant increase in commodity prices, more and more cash must be converted into inventories just to maintain quantities. When the sellers' market passes and balanced stocks must be carried to service the trade, inventory quantities will have to be increased in many companies. The accountant should be able to inform management of the amount of inventory required and carried for each product line and the costs in terms of going interest rates of financing these requirements. The records should provide for the correlation of inventories and sales forecasts so that inventory requirements and the resulting cash requirements can be reflected in the current and long-term cash budgets.

Coordinating Control

In any large industry there must be a central point at which decisions are made and policies established. In the Armstrong Cork Company this coordinating function is vested in an operating committee. All departments having responsibilities relating to materials, as well as the sales and general production departments, are represented. A general vice president is chairman of this committee which meets biweekly. The committee receives reports and

recommendations from the staff and operating departments and either approves, disapproves, or sends the recommendation back for further study. Thus, in a matter of approximately two hours every two weeks, all of the material control functions are coordinated and kept in efficient operation. The smaller the company, the less formal the procedure and the fewer the participants in the coordinating and also in the control functions.

Conclusion

Material is the one inert element of cost. It is completely controllable, but, because it is inert and inarticulate, it does not force itself upon the attention of management. Other problems demand attention and it is assumed that material costs cannot go far out of line. In these days of excessive prices, this is a dangerous assumption. Material is cash in another form. It should have the same care and control as cash.

COMING ARTICLES

In the *N. A. C. A. Bulletin*, August 1, 1948

The Technique of Financial Forecasting
by John G. Robertson, Jr.

Projecting the Monthly Profit or Loss Statement
by Edward W. Hartman

A Capacity Budget Procedure to Set Task for Plant and Sales Force
by F. E. Baridon

Cost Estimating for Long-Term Contracts in a Machine Shop
by Fred W. Murray

DAILY REPORTS TO CONTROL ASSEMBLY LABOR TIME AND COSTS

by JOHN G. GOETTEE,
Formerly Assistant to Factory Manager, Bendix Radio Div.,
Bendix Aviation Corp., Baltimore, Md.

IF COSTS are controlled daily, it follows that monthly and job cost summaries will automatically reflect such control. Our problem of the control of labor in assembling aircraft radio and radar sets was approached from the point of view that, since costs are a summation of fact and judgment, their control rests in the application of good methods, judgment, and corrective action to performance expressed in values readily determinable with a minimum of confusion and expense. In pursuance of these objectives, we decided to employ daily reports, one for each equipment, based on a comparison between the estimated hours on which sales prices are based and the actual hours worked. It was decided to:

1. Set up each month's anticipated production showing the quantities of each equipment set to be produced and the estimated hours allowed in the cost estimate for assembly operation.
2. Collect and summarize daily by departments the man hours spent on each set. (Labor is graded with a minimum and maximum rate on each type of work and if operators actually assigned are generally limited to the grades indicated in the estimate, the summary of man hours worked will give a reasonably good reflection of what the actual dollars and cents cost will be after payrolls are distributed and final cost reports prepared.)
3. Review and analyze each day's summary of actual versus estimated hours with the departmental foreman.
4. Issue individual reports by equipment sets at the completion of each run.
5. Prepare a report monthly of the department's performance on labor.

General Outlines of Costing System

Before additional procedural detail is given with regard to preparation and use of the daily man hour comparisons indicated by

the first three points, it may be well to describe briefly a few general features of our costing. As might be expected, commercial and government electronic and radar equipments are made strictly to quantity and quality specifications. Government units are made to order only; commercial units are made for stock as well.

Many different equipment sets are made, a large proportion with modifications within models. Rather limited quantities are made of most individual models. However, we do keep a basic record revealing the cost of assembling all sets similar in type by assigning a permanent job order number to each type and accumulating costs under it. The same is true of subassemblies common to more than one set or made as service replacements. For these, costs are accumulated under a drawing number and an average cost determined. Modifications and extras on orders are differently treated, being charged directly to the customer's order and kept apart from other costs of production.

Expediter Is Foreman's Control Assistant

The control of work to start in the assembly department is exercised by the foreman through his expediter who, upon request, prepares and submits to stores "accumulation withdrawals" for equipment sets appearing on the master production schedule. When the foreman is informed that material is ready, he will indicate when the job is to be brought out of the stockroom and placed on the line. After assembly, each set is given a series of electrical and mechanical performance tests.

Primary Time and Production Records

The brief summary given may assist the reader in his understanding of the place our daily labor control reports hold with respect to the broad picture of our operations as a whole. The data needed for these reports, besides estimated hours on each equipment set, consist of (1) actual hours spent in each department each day on each set and (2) units produced.

Each operator keeps his or her own time on a job time card. The correct job or account charges are indicated to the operators by their leaders and are checked by regular timekeepers who patrol the department. This information is transferred daily to punched cards for the purpose of computing and distributing the hourly payroll. In connection with this step it is possible to obtain also, with very little extra effort, the desired data daily by jobs with

respect to hours worked. Likewise, the assembly departments maintain a daily record of all units produced.

With the information thus available, it is possible to set up what we call a "control ledger" in which only time and production data are entered. This is our basic control form and is illustrated by

JOB PERFORMANCE RECORD—LABOR

DESCRIPTION: Indicator—Component of mobile—Type No. In-23

Cost Department					Stds. Dept.	
Date	Est. Hrs.	Run Quan.	Setup	Basic R	Date	Std.
7/47	6.1755	100	10.2	1.7969		

Type No. In-23, J. O. No. 2110, Dept. 22

Date 1947		*Explanation*	*Clock Hrs. Wkd.* *Day*	*To Date*	*Labor Hrs.* *Unused*	*Units to Test* *Today*	*Bal. Due*
Jul.	1	Setup			617.6		100
	18	Assemble	1.7	1.7	615.9		
	21	Assemble	52.2	53.9	563.7		
	22	Assemble	63.9	117.8	499.8		
	23	Assemble	62.2	180.0	437.6	10	90
	24	Assemble	43.5	223.5	394.1		
	25	Assemble	67.3	290.8	326.8		
Aug.	5	Assemble—foreman advised	42.1	332.9 X	284.7	17	73
	6	Assemble	13.2	346.1	271.5		
	7	Assemble	15.8	361.9	255.7		
	8	Assemble	19.6	381.5	236.1		
	11	Assemble	30.9	412.4	205.2	13	60
	12	Assemble	5.7	418.1	199.5		
	13	Assemble	12.2	430.3	187.3		
		Adjust contacts	7.3				
	14	Assemble	15.6	453.2	164.4	25	35
	15	Assemble—foreman advised	9.1	462.3 X	155.3	35	-0-
		Cleanup	3.4				
	18	Trouble shoot	2.2	467.9	149.7		
	20	Report issued	—	467.9	149.7	100	—

EXHIBIT 1

Exhibit 1. A sheet in the form shown is prepared for each equipment set to be assembled, with provision for: (1) equipment description (type number and job number), (2) cost estimate in hours, (3) quantity to be run, (4) actual clock hours worked, (5) allowed hours unused and (6) units due to stock (by way of the test department). At the first of each month, the quantity and estimated hours for each equipment set to be made during the month are set up in this ledger. Each day's actual hours worked (summarized by tabulating equipment) and units produced are entered. Each sheet indicates in ledger balance fashion at the end of each day the unused hours and remaining sets due stock. In

the event that the full run is not released to the department for production all at one time, it will be necessary to use two additional columns in the body of the form to enter the quantity and applicable estimated hours opposite the dates of release so that labor hours unused and balance due to stock may always relate only to work which has actually been issued to each department.

Daily Review and Corrective Action

As soon as the data for the day are entered on each sheet in the control ledger, a general review is held with the foreman and his leaders. This may bring to light:

1. *Obviously incorrect charges.* These include entries to: (1) job orders not running or (2) nonexistent accounts. This may be due to misunderstanding or ineptitude on the part of the operator. It may also be due to incorrect punching from the time cards on the part of the key punch operator. Through discussion, the causes of such errors become readily apparent.
2. *Excess help on jobs.* The foreman knows generally the amount of time that should have been put on a job from the number of people he has assigned to it. If the total hours for a day appear to be excessive, a check of the people whose time is charged to the job will reveal any who do not belong.
3. *Unauthorized work.* People who loiter on first aid trips, spend too much time cleaning up, or work on equipment the production of which is being held in abeyance, can be identified and the individual cases discussed.
4. *Completed equipment sets lying dormant in test area.* Charges for repairing or cleaning sets completed some time previously may indicate that insufficient attention is being given the testing of sets for stock. Such product represents a high unit investment value and it is possible that, for the want of a small replacement part and push on the part of some responsible person, the equipment may be permitted to lie around longer than necessary. As long as equipment sets remain in a department, operators and repairmen will find something to do to them.
5. *Overtime work on nonessential sets.* People may be held after hours or asked to come in on off days to do special

work but, because the supervisor has failed to have such work prepared, may be assigned to whatever is at hand. This may result in doing overtime work on sets which go to stock and do not move for several months.

6. *Skipped operations.* Work done by highly rated repairmen in the test department which should have been done on the assembly line indicates that both the operator and inspector have been remiss in their jobs.
7. *Reconstructed sets.* Occasionally a set may become damaged beyond repair after being reported as produced. Its replacement cost should be at the expense of the department causing the damage but may inadvertently be charged to productive labor.
8. *Work in advance of schedule.* Small stocks of certain components, such as hardware and cabling wire, are maintained in the department. Whenever work on future schedules is done too far in advance of requirements just to keep operators busy, it will immediately show up in this daily analysis.
9. *Process changes.* Work may actually be performed in the various departments in different proportions than those shown in the estimate. An adjustment of the estimate between departments is required so each foreman's estimated hours will be put on a comparable basis with his actual time. A check of questionable operations being performed and reflected in the accumulated actual hours may indicate the desirability of a change in the process itself. For instance, it may be found that a counterboring operation on a cover done to clear the end of a shaft may be eliminated by a slight change in pinning the gear.

Statement of Performance on Each Run

The foreman is advised when the accumulated actual hours on each job, as shown by the control ledger sheet, amount to half of the estimated hours. This permits, even requires, him to give each incomplete job an over-all review and, if less than half the required work has been done, to make whatever rearrangements he can to recover lost ground and end up by at least breaking even on actual against estimated hours. As a last check, he is again advised when actual hours reach 75 per cent of those estimated.

DEPT. 22 LABOR PERFORMANCE

Description: Indicator (Mobile) Type No. IN-23

	Total	*Unit*
Quantity completed	100	
Date started	7/18	
Date completed	8/18	
Hours allowed (cost estimate)	618	6.18
Clock hours used	468	4.68
Savings (approx.)	150	1.50
Loss (approx.)		

Date issued: August 20, 1947 Issued by John Doe
Remarks: 7 hours were spent adjusting contacts on special operations.

EXHIBIT 2

At the end of each run of a set of equipment, a short summary is made showing the outcome, as illustrated in Exhibit 2 which discloses the results of the hypothetical run exemplified in Exhibit 1. This makes known immediately, in hours, the approximate cost and savings realized on all lots of equipments produced.

Review of Estimated Hours at Start of Run

Cost estimates for the determination of sales prices on new equipment set are generally prepared well in advance and frequently before an equipment set is completely engineered. Because of this practice, the product that is finally produced may be changed somewhat from the proposed equipment at the time the estimate was prepared. If this condition exists, it usually will be detected when a job is being started in assembly.

The assembly foreman is advised of the number of hours allowed for each unit at the time a job is being set up in his department and the total hours for the given run. Because of his experience and the necessity of laying out his work in terms of people for the quantity required, he can generally tell if the estimate is in line. If it appears that the estimate is too low, the standards department is requested to review it, taking into consideration any and all changes included in the equipment between the time the estimate was prepared and production started. If it develops that the estimate is too low, the engineering and standards departments are asked to try and rearrange the components and the method of assembly so as to reduce the assembly labor to the estimate. In those instances in which the actual labor will exceed the

estimate in spite of all economies, the estimating department is asked to re-estimate and the sales department to reprice, where possible, based on current conditions.

Premium Costs of Short and Minimum Runs

Every cost estimate and, to a degree, the sales price, is built up on a given quantity. Assuming normal efficiency, no release to production should be for less than this stated quantity. Otherwise the unit cost of production may be expected to be adversely affected by having to bear a larger share of the cost of overcoming inertia, setup, and learning. When sales drop to the point that the production of a given quantity will overburden inventory, adjustments should be made in either the sales price or basic costs of production or both so a profit can be realized on whatever smaller quantity is in line with current market conditions. On a shrinking market, however, it may be desirable to accept smaller runs, taking some loss in production in preference to the greater risk of inventory loss.

APPROXIMATE SAVINGS EFFECTED ON ASSEMBLY LABOR HOURS

Assembly Department 22

For Period August 3 Through August 30

Equipment		Number of sets delivered to test	Hours					
			In opening process inventory	Worked in period	In closing process inventory	In sets delivered to test	In cost estimate	Saved
Type number	Description							
			Airline Equipments					
IN-23	Indicator ..	100		468		468	618	150
TB-128	Jack box..	126	352	471	213	610	684	74
MA-76	Amplifier..	15	125	156	132	149	104	(45)
	Total Airline ...	241	477	1,095	345	1,227	1,406	179
			Other Equipments					
CA 12-4	Test set..	19	150	114		264	289	25
CS 6	Case	21		314	151	163	166	3
	Total Other	40	150	428	151	427	455	28
	GRAND TOTAL...	281	627	1,523	496	1,654	1,861	207

EXHIBIT 3

Monthly Summary of Assembly Labor

At the end of each month, a report is prepared (Exhibit 3) showing what savings have been realized on assembly labor. In order to arrive at the actual hours spent on units completed within the month, a work-in-process inventory is taken and used to work out the following formula: Beginning inventory in hours plus actual hours worked for the period less ending inventory in hours equals the actual hours in sets delivered to the test department, and may be compared to estimated hours for those sets. This report serves to highlight all items showing a loss or marginal savings because of inadequate sales prices or inefficient assembly operations. A check of the daily findings on the basis of the comparisons set forth earlier in this article will indicate whether or not corrective steps have been taken. A physical inspection of work-in-process inventory will turn up all items made in advance or on hand because of schedule cutbacks or cancellations.

Effectiveness of Control Provided

To operate a daily labor control effectively, an individual should be fairly familiar with equipment sets being assembled and thoroughly conversant with conditions existing in the department. He needs this backkground to be able to evaluate each day's results properly and discuss them on common ground with the foreman and his supervisors. The foreman is fundamentally an operating man whose time is largely taken up with problems of personnel, quality, engineering changes, material shortages, and maintaining schedules. Unless there is a qualified service available to him for the summarization and proper evaluation of his daily operations in terms of profit or loss, the foreman is placed at a disadvantage in developing his own position and the company in turn loses the benefits to be derived from the application of corrective measures.

The plan described puts the assembly departmental foreman in the position of being able to measure his performance on labor as each job progresses and to take whatever corrective measures he can to assure a profit on every job possible. On those units for which the hours (and probably the labor dollar cost also) are running over the estimate because of conditions beyond his control, he is able to make the situation known to others well in advance of the day of reckoning when the dollar cost reports are issued. For us, this control has paid off in the form of more jobs showing savings, often large, on assembly labor than ever before.

A STORES CONTROL PROCEDURE

by FORREST W. BERRY,
Assistant Manager, Portage Country Club,
Akron, Ohio

THE storeroom plays a major part in the continuous operation of an industrial plant. Practically all storeroom items are either production materials, spare parts for the various items of equipment, or materials used in the repair and maintenance of that equipment. The depletion of any one of the items might necessitate a cutback in production, even complete curtailment. A limited survey recently made to determine the requirements for a good stores system, covering related operations of the storeroom, the maintenance and purchasing departments, and of stores accounting, indicated that a stores control should disclose:

1. Quantities on hand.
2. Estimated withdrawals to be made.
3. Material on purchase requisition.
4. Material on order.
5. Material received but not vouchered.
6. Unit cost of materials.
7. Available vendors, unit prices, terms, f.o.b. point, and days required for delivery.
8. Standard purchase.
9. Location in storeroom.
10. Relative quantity on hand in relation to order point.
11. Stocks reserved.
12. Follow up.
13. Item index (number assigned to each commodity).
14. Control to general ledger.
15. Information at one point.

These requirements are reasonably well met by the full procedure described in this article. Some of them are implicit in the forms used and others in the methods employed to maintain the data for which the forms call. The incorporation of the ideas into a simple procedure was found readily adaptable to card records devised to feature flexibility, visibility, and ease of operation. Two companion cards are used for each item, a Stores History Card (Exhibit 1) to record the more permanent data and a Stores Ledger Card (Exhibit 2). These cards are filed together in a file pocket which allows for 5/16" visibility. The pocket is furnished with two so-called "sliding signals," designated "right" and "left." The installation described is capable of handling 10,000 different stores items valued at $500,000.

STORES HISTORY CARD

COMMODITY NO.	UNIT	STD. PURCHASE	LOCATION	DESCRIPTION

SUMMARY OF ISSUES

	NO.	VENDOR	CATALOG NO.
JAN /JUL			
FEB /AUG	NO.		
MAR /SEPT	1		
APR /OCT	2		
MAY /NOV	3		
JUN /DEC	4		
TOTAL	5		

PURCHASE REQUEST				ORDER PLACED				RECEIVED								
DATE	ON HAND ON ORDER	QUANTITY WANTED	APPR.	DATE	ORDER NUMBER	QUANTITY	VEN. NO.	DATE	R.S.NO.	QUANTITY	UNIT PRICE	TERMS	F.O.B.	BAL.	DAYS DEL.

EXHIBIT 1

The entire stores accounting is located in the storeroom office along with the storekeeper to permit accessibility to the visible files and to minimize the duplication of stores records. Materials are stocked in the storeroom after proper authorization has been given the storekeeper and it is his responsibility jointly with the stores accountant to see that the proper materials are on hand at all times.

Ordering Procedure

The two cards are placed in the visible file pockets face to face. The stores accountant is responsible for removing the stores history card from the pocket when the stores ledger card indicates that the stock has reached the ordering point. The purchase request section is filled in and forwarded to the storekeeper for approval and, in turn, to the purchasing department for ordering. At the same time the stores accountant moves the left-hand sliding signal from the "complete" section to a position directly over the square on the title slip (exposed to view as shown in Exhibit 2) marked "Req." (requisitioned) to indicate that the material is now in the process of being ordered. The storekeeper's approval should be sufficient authorization for ordering since the storeroom has an approved authorization for each commodity stocked.

Upon receipt of the stores history card bearing the approved purchase request, the purchasing agent issues purchase orders covering the materials after reviewing the data for previous vendor's unit prices, terms, f.o.b point, and days required for delivery, where these are factors. Quantities may vary from the request due to considerations of availability of the item, standard packaging, quantity discounts, and the like. It should be noted that the use of the stores history card eliminates the necessity of writing purchase requisitions and gives the storekeeper and the purchasing agent a complete resumé of a commodity each time it comes up for ordering. If a vendor not listed on the stores history card is selected by the purchasing department, the new vendor's name is inserted on the next open line under the caption "vendor," in the upper right-hand corner, and the line number becomes the vendor's number for use in the body of the card. The purchasing department completes the "order placed" section and sends the card back to the stores accountant.

The stores accountant returns the stores history card to its proper pocket and moves the left sliding signal to a position directly over the square on the title slip marked "On Order."

STORES LEDGER CARD
WITH TITLE SLIP AND TITLE INSERT

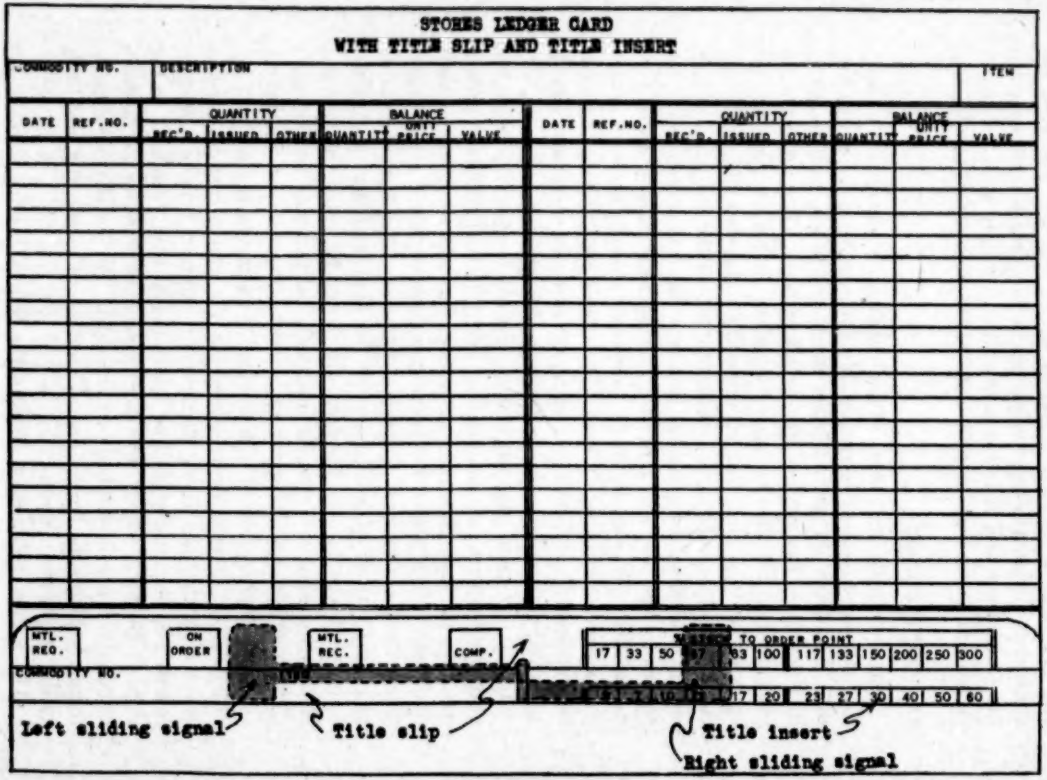

EXHIBIT 2

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Under certain conditions, purchase requests may be rejected by the purchasing agent or some other person interested in the particular stock. Rejection should be noted on the card opposite the purchase request, with the reasons why, and initialed by the person making the rejection.

Receiving of Material

All materials received are recorded on receiving sheets, copies of which go to the stores accountant. The received section of the stores history card is then filled in as to date, receiving sheet reference, and quantity, and a new balance is carried forward. The left sliding signal is moved to a position directly over the square on the title slip marked "Material Received."

The right sliding signal, covering the "stock on hand" half of the title slip is moved along the *lower* scale on the title insert to a position directly over the number serving as the index to the new balance on hand. Due to the range limitations of the title inserts a series of colors is used to designate units, tens, and hundreds. For example, the number 30 on one color scale would represent 300 on another and 3000 on perhaps another.

The stores history card is completed in the "received" section by recording the unit price, terms, and f.o.b. point from invoices routed to the stores accountant. The stores ledger card, which is simply a columnar record for quantities received, issued, otherwise disposed of, and the balance—together with date, transaction reference, and unit price—is then entered with respect to the new purchase. The left sliding signal indicating the status of the order is now ready to be returned to its starting position directly over the square in the title slip marked "Complete."

Recording Consumption

Until it is time for the next purchase, the left sliding signal stays in this position and the stores history card requires no further entry. This is the period of withdrawals against the quantity which has been built up by the purchase and these withdrawals are recorded on the stores ledger card. The right-hand sliding signal is adjusted toward the center each time to reflect progress toward the reorder point when the procedure cycle will be repeated.

Issues of stores to process are made on requisitions to the storekeeper which identify the material and show the quantity released. These requisitions are priced and posted to the stores ledger cards by the stores accountant, using last cost (a conven-

EXHIBIT 2

ience which has proved practicable and has led to no serious errors) except where this cost indicates a marked change. In such instances, an average is worked, used for the requisition in question, and inserted on the stores ledger card. Returns to stores are recorded in red on the stores ledger card.

Dollar Reconciliations; Physical Quantity Checks

A running control in dollars is maintained for each principal classification of stores by recording amounts from invoices and from requisitions as priced, as well as any other adjustments effected by special entries. Total charges and credits to these group controls in the aggregate are checked with the stores controlling account in the general ledger at the end of each period. At intervals, a reconciliation is also effected between individual group controls and the quantity detail of the related stores ledger cards by extending the quantity balances at current unit costs. Small differences developing, due to the method of pricing requisitions and other factors, are adjusted in favor of the balance derived from the detail cards.

Check back from the quantities shown on stores ledger cards to physical quantities on hand is also made on a serial basis. The time usually selected is when the stores history card is removed from the file pocket for reordering of material, i.e., when the quantity is low. Requisitions or credit memoranda are issued to effect adjustment of card quantities to physical quantities and these entries are set out for prominence in the "Quantity—other" column of the stores ledger card. All items are physically inventoried at least once a year and a review of the cards is made annually to pick up those which have not been reordered within a year's time. In this group are likely to fall items for which adjustments may have to be made to the cards to record obsolescence and damage. Related entries are likewise made in the "other" column to avoid confusion with entries for receipt and issuance.

Reserved Stock

Stores materials are sometimes reserved for special construction or maintenance jobs through the use of material lists prepared by the engineering department. These lists are sent to the storeroom for the assigning of commodity numbers to materials which are stock items. These commitments are recorded in the stores detail by introducing a third card, known as a reserve stock card

for each commodity listed. This card shows the date, job number, and quantities to be withdrawn. As the material is issued from stock for the various jobs, the committed balances are reduced accordingly. Stock so committed is deducted from the actual inventories in setting the right sliding signal.

Establishing Order Points and Summarizing Activity

Order points are determined for each commodity by taking into consideration quantities used, lapse of time between order and delivery, importance of the commodity in relationship to production, and quantities set aside or reserved for special jobs. As will be noted from Exhibit 2, a heavy vertical line at 100 per cent on the upper or percentage scale shows visibly the order point for each commodity. The lower scale indicates the units of the commodity on hand. As the sliding signal approaches the order point, the procedures for ordering are initiated. As the sliding scale continues further downward toward zero stock on hand, follow-ups should be made in order to set in motion any necessary expediting. A small card is used as a follow-up record for this purpose, and placed over the title slip for the storekeeper's information as to progress of the unfilled order.

In the upper left-hand corner of the stores history card is a block for record of stock activity by months. This is used for all regular issues of stock from stores *except* adjustments, returns, and reserve stock issues. Its purpose is to give the storekeeper an idea of the potential demand after excluding all extraordinary issues or credits to stock.

Value of Procedure Dependent on Use of Data

The successful operation of the entire method for stores accounting depends entirely upon the accuracy of the stores ledger cards and the stores history cards in relationship to the physical inventories, the determination of the order points, and the facility with which trends may be analysed to minimize the overstock or depletion of any given commodity. The procedures outlined reduce to a minimum the detail involved in routine accounting for stores but in turn increase detail in the control of stores, requisitioning, ordering, visibly recording quantities on hand, and the following up of items. The advantages of this additional record keeping depend entirely on the extent of use of the information thus made at least potentially available.